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Remarks

Favorable review is requested in view of the above amendments and following remarks. Editorial amendments have been made to the specification. Claims 1, 31, 50, and 54 have been amended for clarification and are supported, for example, at Tables 11 - 14 and at page 75, lines 21 - 32 of the specification. Claims 76 and 77 have been added and are supported, for example, at Table 11 - 14 of the specification. Claims 8, 10, 28, and 55 have been cancelled without prejudice. No new matter has been added. Claims 1 - 29, 31, 50 - 64, and 74 - 77 remain pending in the application.

Oath or Declaration

The Examiner indicated that a new declaration was needed because the signed signature of Mayumi Uno did not match the typed name of Mayumi Otoba. A Communication Regarding Inventors was submitted on November 22, 1999 indicating that the name of the first inventor had changed from Mayumi Otoba to Mayumi Uno due to marriage. A Corrected Filing Receipt was mailed on July 2, 2002 indicating Mayumi Uno as the first named inventor. For clarification purposes, a newly signed Combined Declaration and Power of Attorney is enclosed.

Rejection under 35 U.S.C. § 103

Claims 1 - 29, 31, 50 - 64, and 74 - 75 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshioka et al. (U.S. Patent No. 5,194,363) in view of Yoshioka et al. (JP 04 - 052188) and either of Yoshitomi et al. (JP 63 - 171453), Kinou et al. (JP 03 - 248338 or JP 01 - 276453), or Shino et al. (JP 05 - 274726). Applicants respectfully traverse this rejection, and respectfully request reconsideration in view of the following comments.

Claims 1 and 50 are directed to optical recording media having a reversible phase change recording layer. Claim 31 is directed to the use of an optical phase change recording medium for recording/reproducing/erasing information. Claims 1 and 31 require a barrier layer that includes one selected from the group consisting of GeXN and GeXNO, wherein the content of X to the total content of Ge and X in said barrier layer is 10 atom % to 40 atom %, and the content of N in said barrier layer is at least 40 atom %. Claim 50 requires a Ge-containing layer comprising one selected from the group consisting of GeXN and GeXON, wherein the content of X to the total content of Ge and X in said Ge-containing layer is 10 atom % to 40 atom %, and the content of N is said Ge-containing layer is at least 40 atom %. The cited references fail to disclose or suggest a barrier layer (Ge-containing layer) wherein the content of X to the total content of Ge and X in

said Ge-containing layer is 10 atom % to 40 atom %, and the content of N is said barrier layer (Ge-containing layer) is at least 40 atom %. Moreover, the barrier layer or Ge-containing layer as claimed provides unexpected and improved weather resistance and recording repetition characteristics in a phase-change recording layer. See Tables 11 - 14 of the specification. Withdrawal of the rejection is requested.

Claim 76 is directed to optical recording media having a reversible phase change recording layer requiring a barrier layer that includes GeXNO, wherein the content of X to the total content of Ge and X in said barrier layer is 5 atom % to 40 atom %. Claim 77 is directed to optical recording media having a reversible phase change recording layer requiring a Ge-containing layer that includes GeXON, wherein the content of X to the total content of Ge and X in said Ge-containing layer is 5 atom % to 40 atom %. The cited references do not disclose or suggest a GeX-O-N layer. In addition, the references fail to suggest that the content of X to the total content of Ge and X should be 5 atom % to 40 atom %. Thus, claims 76 and 77 are even further removed from the cited references.

Double Patenting

Claims 1 - 29, 31, 50 - 64, and 74 - 75 were rejected for obviousness-type double patenting over claims 8 and 9 of U.S. Patent No. 6,503,690. Applicants respectfully traverse this rejection, and respectfully request reconsideration in view of the following comments.

A Terminal Disclaimer has already been filed for U.S. Patent Application Serial No. 09/132,022 on February 28, 2002. A copy is enclosed. U.S. Patent Application Serial No. 09/132,022 issued as U.S. Patent No. 6,503,690. Thus, another Terminal Disclaimer for U.S. Patent No. 6,503,690 does not need to be filed. Withdrawal of the rejection is requested.

Conclusion

In view of the comments presented herein, favorable reconsideration in the form of a Notice of Allowance is respectfully requested. If any further question should arise, the Examiner is invited to contact Applicants' representative at the number listed below.

Respectfully Submitted,

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Dated: June 6, 2003

By _____
Douglas P. Mueller
Reg. No. 30,300
DPM:CAJ

Version with Markings to Show Changes Made

In the Specification

Please replace the paragraph beginning on page 70, line 28 and ending on page 71, line 8 with the following new paragraph.

--When forming the diffusion preventing layers 67 and 68, there was no difference between samples 100 to 109 as to the sputtering gas, which was a mixed gas comprising Ar and nitrogen, a sputtering gas pressure of 10 mTorr, and a sputtering power density of 6.37 W/cm^2. When forming the diffusion preventing layer 67, the partial pressure of nitrogen in the sputtering gas was constantly 40 % (40 vol % nitrogen). When forming the diffusion preventing layer 68, the partial pressure of nitrogen in the sputtering gas was changed to 10%, 20%, 30% and 40%. In this case, the content of nitrogen contained in the diffusion preventing layer 67 was 56 atom % and the contents of nitrogen contained in the diffusion preventing layer 68 were 22 atom %, 37 atom %, 50 atom %, and 56 atom %, respectively. [In this case, the contents of nitrogen contained in the diffusion preventing layers 67 and 68 were 22 atom %, 37 atom %, 50 atom %, and 56 atom %, respectively.] Furthermore, the contents of oxygen contained in the diffusion preventing layers 67 and 68 were 4 atom %, 5a tom %, 6 atom %, and 7 atom %, respectively. The oxygen was contained because impurity oxygen present in the chamber was absorbed in the layers. The ratios of nitrogen and oxygen were analyzed by RBS (Rutherford Backscattering Spectroscopy).--

In the Claims

Please amend claims 1, 31, 50, and 54, cancel claims 8, 10, 28, and 55 without prejudice, and add claims 76 and 77, as indicated herein.

1. (Three Times Amended) An optical information recording medium comprising a substrate and a multilayer film, the multilayer film comprising:

a barrier layer;

a first protective layer that comprises sulfur; and

a recording layer generating a reversible phase-change which can be optically detected according to an irradiation of an energy beam;

wherein said barrier layer is formed between said first protective layer and said recording layer and in contact with said first protective layer and said recording layer, and includes one selected from the group consisting of GeXN and GeXNO, where X is [GeN and GeNO and] at

least one element selected from the group consisting of Al, B, Ba, Bi, C, Ca, Ce, Cr, Dy, Eu, Ga, Hf, In, K, La, Mn, Nb, Ni, Pb, Pd, Si, Sn, Ta, Ti, V, W, Yb, Zn, and Zr, and

wherein the content of X to the total content of Ge and X in said barrier layer is 10 to 40 atom %, and the content of N in said barrier layer is 40 atom % or more.

31. (Four Times Amended) A method of recording/erasing/reproducing optical information, comprising the steps of:

providing an optical information recording medium comprising a substrate and a multilayer film, the multilayer film comprising a recording layer generating a reversible phase-change which can be optically detected according to an irradiation of an energy beam, a barrier layer, and a protective layer that comprises sulfur;

recording a signal to said recording layer by irradiating said recording layer with a modulated laser beam erasing a signal recorded on said recording layer by irradiating said recording layer with a laser beam having a predetermined power level;

reproducing a signal recorded on said recording layer by irradiating a laser beam to said recording layer and detecting a light strength of a reflection light or a transmitted light from said recording layer;

wherein said barrier layer is formed between said protective layer and said recording layer and in contact with said protective layer and said recording layer, and includes one selected from the group consisting of GeXn and GeXNO, where X is [of GeN and GeNO and] at least one element selected from the group consisting of Al, B, Ba, Bi, C, Ca, Ce, Cr, Dy, Eu, Ga, Hf, In, K, La, Mn, Nb, Ni, Pb, Pd, Si, Sn, Ta, Ti V, W, Yb, Zn, and Zr, and

wherein the content of X to the total content of Ge and X is said barrier layer is 10 atom % to 40 atom %, and the content of N in said barrier layer is at least 40 atom %.

50. (Four Times Amended) An optical information recording medium comprising a substrate and a multilayer film, the multilayer film comprising phase-change recording layer having reversibly changeable optical characteristics and a Ge-containing layer comprising one selected from the group consisting of GeXN and GeXON as a main component, and a protective layer comprising sulfur, wherein the Ge-containing layer is formed between the phase-change recording layer and the protective layer,

wherein X is at least one element selected from the group consisting of elements belonging to Groups IIIa, IVa, Va, VIa, VIIa, VIII, Ib and IIb and carbon, and

wherein the content of X to the total content of Ge and X in said Ge-containing layer is 10 atom % to 40 atom %, and the content of N in said Ge-containing layer is at least 40 atom %.

54. (Amended) The optical information recording medium according to claim 52, wherein the first Ge-containing layer has a composition represented by $(Ge_{1-m}X_m)_aO_bN_c$ ([$0 < m < 1$] $0.1 \leq m \leq 0.4$, $a > 0$, $b \geq 0$, $c > 0$, $a + b + c = 100$), and the second Ge-containing layer has a composition represented by $(Ge_{1-n}X_n)_dO_eN_f$ ($0 < n < 1$, $d > 0$, $e \geq 0$, $f > 0$ $d + e + f = 100$), and the following inequality is satisfied: $m < n$.